

lanceolata, longē petiolata, circa 29 cm., longa et 25 mm. lata, utrinque sparsē pubescentia. Folia caulina gradatim breviora, breviter petiolata. Caulis teres, subglaber, basi ramis pluribus verticillatis ascendentibus ipsum saepe excedentibus instructus. Spica sublaxa, superne nutans. Petala flava, circa 20 mm. longa, ascendentia. Antherae stigmata attingentes. Alabastrae subglabrae, obsoletē quadrangulares, apices sepalorum subterminales.

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EXPLANATION OF PLATES.

Plate 100. *Oenothera angustissima*, sp. nov. Rosette, showing the beginning of the crown branches before the central stem appears.

Plate 101. The same. Two flowering shoots showing leaves, flowers and fruits; and three leaves from the mature rosette.

SYSTEMATIC STUDIES ON OENOTHERA,—II. THE DELIMITATION OF OENOTHERA BIENNIS L.

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(Plates 102 and 103.)

THE problem of limiting the application of the name *Oenothera biennis* L. to one of the many forms which now pass under this name is largely bibliographical, to be solved by a careful analysis of the Linnaean account (Sp. Pl. ed. 1. p. 346. 1753.) which is quoted below:

biennis 1. OENOTHERA foliis ovato-lanceolatis planis. *Vir. cliff.* 33. *Hort. ups.* 94. *Gron. virg.* 254. *Roy. lugdb.* 251. *Gort. gelr.* 78.
Oenothera foliis ovato-lanceolatis denticulatis, floribus lateralibus in summo caulis. *Hort. cliff.* 144.
Lysimachia lutea corniculata. *Bauh. pin.* 245. 516. * *Moris. hist.* 2. p. 271, f. 3, t. 11, f. 7.
Habitat in Virginia unde 1614, nunc vulgaris Europae. ♂

Although no part of this account is original to the *Species Plantarum*, Linnaeus was himself the author of the first two of the three polynomials of which it consists. In 1737 Linnaeus published companion works, the *Viridarium Cliffortianum* and the *Hortus Cliffortianus*, in which these polynomials first appeared. We find in the

preface to the *Viridarium* the following explanation of the relationship between the two works:

"Nomina quibus enumerantur plantae mutuata sunt ex Horto Cliffortiano fere omnia (paucis emendatioribus), singulis adjecto duplici numero, quorum priore paginam Horti Tui indicavi, posteriore vero generis speciem, ut si quae differentia minus indubitata occurreret, in majori opere eo facilius consulerentur synonyma."¹

It is therefore clear that the following accounts, with the exception of the synonymy which is quoted in the *Hortus*, refer to the same plant.

"*Oenothera foliis ovato-lanceolatis planis.*

Oenothera foliis ovato-lanceolatis denticulatis, floribus lateralibus in summo caulis. 144. 1."

Virid. Cliff. p. 33.

"1. *Oenothera foliis ovato-lanceolatis denticulatis, floribus lateralibus in summo caulis.*

Onagra latifolia. *Tournef. inst.* 302.

Lysimachia lutea corniculata. *Bauh. pin.* 245. 516.

Lysimachia lutea corniculata non papposa virginiana major.

Moris. hist. 2. p. 271. f. 3, t. 11. f. 7.

Lysimachia lutea corniculata latifolia lusitanica. *Barr. rar. t.* 1232.

a *Onagra latifolia, floribus amplis.* *Tournef.*

Onagra latifolia, flore dilutiore. *Tournef.*

Crescit in Virginia, aliisque Americae locis, ante centum et viginti annos in Europam translata, nunc spontanea facta, copiose crescit ubique in campis arenosis Hollandiae.

Primo anno vix floret, altero floret et perit."

Hort. Cliff. p. 144.

The third polynomial quoted by Linnaeus in the *Species Plantarum*, *Lysimachia lutea corniculata* Bauhin, has not been satisfactorily identified by recent authors.² Nevertheless Bauhin's description is a lengthy one, and, for his time remarkably satisfactory, so that it is

¹ "The names by which the plants are enumerated are almost all taken from the *Hortus Cliffortianus*, a few having been somewhat improved and to each having been added a duplex number, by the first part of which I have indicated the page of your *Hortus* and by the last the species of the genus, so that if any somewhat doubtful distinction should present itself, the synonyms of the larger work might be the more readily consulted."

² Dr. R. R. Gates at one time attempted to identify *Lysimachia lutea corniculata* with what we now know as *Oenothera Lamarckiana*. See the following papers:

The earliest description of *Oenothera Lamarckiana*. *Science*, 2d. ser. xxxi (1910) pp. 425-426.

Early historico-botanical records of the *Oenotheras*. *Proc. Iowa Acad. Sci.* xvii (1910) pp. 85-124.

by no means improbable that his plant, which was the first *Oenothera* to be introduced into the botanical gardens of Europe, may yet be identified with some degree of plausibility. Whatever Bauhin's plant may have been, however, there is nothing in the description to indicate its identity with the Linnaean plant of the sand-dunes of Holland. It cannot, therefore, be chosen as the type to bear the name *Oe. biennis*, since a Linnaean species should certainly be typified by a plant with which Linnaeus was himself acquainted.

In the case of many hopelessly composite Linnaean species the name has been associated by later botanists with that one of several synonyms which Linnaeus referred to in the closing line of the diagnosis,—“Habitat in Virginia,” or perhaps “Habitat in Canada.” In such a case Linnaeus has been tacitly interpreted as having himself pointed out that a Gronovian diagnosis (sometimes associated with a Clayton specimen) or a Kalm specimen in his herbarium, should be crucial in interpreting his species, rather than earlier references to plants of which he had no personal knowledge. In the case of *Oenothera biennis*, however, the “Habitat in Virginia unde 1614, nunc vulgaris Europae” clearly refers to the similar statement in the *Hortus Cliffortianus*, “Crescit in Virginia, aliisque Americae locis, ante centum et viginti annos in Europam translata, nunc spontanea facta, copiose crescit ubique in campis arenosis Hollandiae,” and affords no basis whatever for selecting as the type of *Oe. biennis* any other plant than that which grew in the dunes of Holland. As a matter of fact, *Oenothera foliis ovato-lanceolatis planis* L. was admitted to Gronovius' *Flora Virginica* (p. 154, not p. 254 as cited in *Sp. Plant.*) on the basis of Linnaeus' statement in the *Hortus Cliffortianus* that the plant of Holland had been introduced from Virginia, and not on the basis of notes or specimens from Clayton.

The plant which grew abundantly on the sand-dunes between Haarlem and Leyden in 1737, which Linnaeus was probably able to see in the course of a half hour's walk from the garden of Clifford, was no doubt the same species which is common there today. The fact that it has not been exactly duplicated in the material which has recently been assembled from American localities is not at all surprising, in view of the fact that our flora contains a number of closely related species and varieties, some of which seem to be very local in their distribution. I am informed by Professor de Vries that there are but two strains of *Oenothera* in the vicinity of Amsterdam which

conform to what is usually called, in a collective sense, *Oe. biennis*. They differ only in flower color, one having flowers of a lighter color than the other. The light-colored form has only become abundant in recent years, through its prompt occupation of a newly created habitat, the rights of way of the more recently constructed railroads. It has long occurred at many localities in Holland, however, and may be identified with reasonable certainty with the var. *a* of Linnaeus' *Oenothera foliis ovato-lanceolatis denticulatis, floribus lateralibus in summo caulis* (Hort. Cliff.). To be sure Linnaeus assigned this plant no name of his own, citing merely two polynomials of Tournefort's. One of them, however, *Onagra latifolia, flore dilutiore* Tourn. was merely a new name for Hermann's *Lysimachia corniculata non papposa, Virginiana, major, flore sulphureo* (Hort. acad. Lugd.-Bat. Catalogus, 1687) which was grown and described at Leyden half a century before Linnaeus' residence in Holland. We are therefore justified in treating the lighter-flowered plant of Holland as a variety of the other, which is to be regarded as the type of *Oenothera biennis*. The two plants, according to Professor de Vries, differ in the one character only.

It would hardly have been worth while to give in so much detail the reasons for selecting the common plant of Holland as typical *Oenothera biennis* but for the fact that certain botanists do not seem to realize that such a selection should be made according to principle. Dr. Britton, for instance, seems to have been able to select from among the American *Oenotheras* one which he arbitrarily pronounced to be *Oenothera biennis* "in the strictest sense."¹

In a recent paper, Dr. Gates² has mentioned a specimen in the Linnaean Herbarium which he calls "the type specimen of Linnaeus's *Oenothera biennis* in the Species Plantarum." It would seem to be unnecessary to point out that Linnaeus had no "types" in the modern sense, and that the specimens in the Linnaean Herbarium cannot be

¹ "...a number of plants of *Onagra biennis* (in the strictest sense), growing in uncultivated land in the New York Botanical Garden in 1903, were selected to form the basis of a pedigree culture in 1904." Macdougall, Vail, Shull, and Small; *Mutants and Hybrids of the Oenotheras*, p. 9, 1905. "Parental individuals were selected and verified by Dr. N. L. Britton in 1903, and from the seeds furnished by them the plants were grown which furnished material for the descriptive diagnosis published in a previous paper (Macdougall, Vail, Shull and Small, 1905). This is not the species growing wild in Europe and cited by de Vries in his 'Mutationstheorie.'" Macdougall, Vail, and Shull: *Mutations, Variations and Relationships of the Oenotheras*, p. 56, 1907.

These quotations refer to the same culture.

² Gates, R. R.: *Mutation in Oenothera*. *American Naturalist* xlv (1911) pp. 577-606.

considered as "types" unless there is actual evidence that Linnaeus drew up his description wholly or in part from the preserved specimen.¹ In the case of *Oenothera biennis*, especially, where nothing in the account given in the *Species Plantarum* is original to that work, no herbarium specimen can be interpreted as a type unless it is definitely associable with the *Hortus Cliffortianus*. Mr. Gates himself states² that "...the actual specimens in the British Museum...which are supposed to have served as the types for the *Hortus Cliffortianus* are not fully authenticated. The handwriting is said not to be that of Linnaeus..." etc. Under the circumstances the best course seems to be to accept as true *Oenothera biennis* the common plant of Holland which Professor de Vries has referred to under this name in his *Mutationstheorie*. A diagnosis of this plant follows.

OENOTHERA BIENNIS L. Biennial. Mature rosettes large, sometimes 65 cm. in diameter (smaller if forced to flower the first year). Outer leaves with petioles 9–10 cm. long and oblanceolate or oblong lanceolate blades, 20–24 cm. long, 5.5–7.5 cm. broad, gradually narrowed to the sinuate-dentate base, distantly and minutely repand-denticulate toward the abruptly obtuse or acutish apex, with a sparse pubescence on both sides of short, sharp, arcuate hairs. Flowering plant about 7–10 dm. high, roughly pyramidal in outline, bearing cauline branches in all the lower axils, and flowers in all the upper axils of the main axis; branches with empty axils below and flowers above; stems and foliage green. Stem pubescence consisting of four types of hairs: I sharp-pointed, thick-walled granulose-roughened hairs from a tuberculate base (few); II similar but shorter hairs varying greatly in length, without a tuberculate base (the predominant type); III thin-walled hairs, round at the apex, of practically uniform diameter, or slightly clavate (few); and IV very small, ampulliform thin-walled hairs (mostly in the inflorescence). Lower stem leaves with blades about 16 cm. long, 4.5 cm. wide, lanceolate, acute, distantly denticulate, tapering at the repand-dentate base to a petiole about 4 cm. long. Uppermost stem leaves short-petioled, forming a gradual transition to the lower bracts, 10 cm. long, 3 cm. wide. Lower leaves of the branches (subtending neither branches nor flowers) ovate, acute, 5.5 cm. long, 3 cm. wide. Leaf-like lower bracts of both primary and secondary axes passing gradually to practically entire narrowly lanceolate bracts about 25 mm. long and 4 mm. wide, (i. e., $2\frac{1}{2}$ times as long as the ovary at flowering time), clothed with hairs of type II above and types II and III below. Flowers of medium size. Ovary 10 mm. long. Hypanthium 35 mm. long, slender, expanding from a diameter

¹ In this connection see —

Hitchcock, A. S.: Types of American Grasses. Cont. U. S. Nat. Herb. xii (1908) p. 115.

² *Am. Nat.*, xlv (1911) p. 587.

of 1.3 mm. near the base to 3 mm. at the orifice, sparsely pubescent with a few arcuate hairs of type II and more numerous perpendicular hairs of type III. Calyx segments deflexed in pairs, about 23 mm. long and 4 mm. wide above the base, bearing slender, strictly terminal, red-tipped free appendages 3 mm. long, moderately pubescent, hairs of type II sparse near base but very abundant on the free calyx-tips, hairs of type III predominant except on the free tips, where they are lacking, hairs of type IV abundant on the free tips but absent elsewhere. Petals yellow, becoming darker on fading with a reddish area at the base, obcordate, 20 mm. long, 27 mm. wide. Stigma lobes 6–7 mm. long, appressed, lying at the center of the unopened bud (therefore shorter than the corolla after expansion) surrounded by the slightly longer anthers. Capsules loosely aggregated but still overlapping in the lower part of the fruiting spike, rather more densely aggregated above, mostly between 23 and 27 mm. in length, shorter than the subpersistent foliaceous bracts except above, subquadrangular, apices of the valves neither spreading nor conspicuously emarginate, sparsely pubescent with arcuate hairs of type II and densely viscid-puberulent with very short hairs of type III. Seeds light brown, rather large, 1.7 to 2 mm. long.—Seed received in 1910 from Professor de Vries with data as follows: "*Oenothera biennis*. Pure seed, fertilized by myself in my garden from plants whose parents were collected in the sand-dunes of Holland. . . . The pure race,—the *biennis* often contains the var. *sulphurea*." Plants set out at Bethesda, Md., in the spring of 1911 did not flower during that season and were winter-killed. Sister plants, however, flowered in the garden of Prof. B. M. Davis at the Bussey Institution, and were self-pollinated by him. Their progeny, forced by being started in the greenhouse in the winter and set out early in the spring, flowered in 1912 both at Philadelphia and Bethesda. Herbarium specimens; *Bartlett* 2723, 3113 and 3160.

Oenothera biennis* var. *sulphurea de Vries *in litt.* *Formae speciei typicae omnino similis floribus pallidioribus sulphureis exceptis.* An *Lysimachia corniculata non papposa, Virginiana, major, flore sulphureo* Herm. (Hort. Lugd.-Bat. Cat. p. 396. 1687) et *Lysimachia lutea corniculata flore sulphureo* Herm. (Florae Lugd.-Bat. Flores, p. 95. 1690) et *Oenothera foliis ovato lanceolatis denticulatis, floribus lateralibus in summo caulis*, var. *a*, Linn. (Hort. Cliff. p. 144. 1737)? — Occurring with the typical form in the sand-dunes of Holland.

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EXPLANATION OF THE PLATES.

Plate 102. Lower figure: *Oenothera biennis*, mature rosette of a plant grown as an annual.

Upper figure: The same plant in flower, showing the long branches of the lower axils and the simple inflorescence of the main axis.

Plate 103. Branch and lower leaf of the same plant.

Photographs by B. M. Davis, of "11.16 a *biennis* H," in cultures grown from seeds of de Vries at the University of Pennsylvania, 1911.